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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/820,463	03/28/2001	Srinivas Nemani	4778/DD/LOW K/JW	5650

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APPLIED MATERIALS, INC.
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EXAMINER

CIESLEWICZ, ANETA B

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 04/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/820,463

Applicant(s)

NEMANI ET AL.

Examiner

Aneta B. Cieslewicz

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 September 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-73 is/are pending in the application.
- 4a) Of the above claim(s) 25-73 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☒ Claim(s) 4, 13, 14 and 23 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

1. During a telephone conversation with Patricia Verlangieri on 6/21/02 a provisional election was made "with traverse" to prosecute the invention of method of thin film deposition (Group I), claim 1-24. Affirmation of this election must be made by applicant in replying to this Office action. Claims 25-73 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Objections

2. Claims 4, 13, 14 and 23 are objected to because of the following informalities: on line 2 of claim 4, it is suggested that for clarification purposes "are" before selected be deleted and "consisting" should be added after group; on line 2 of claim 13, "consisting" should be added after group; on line 2 of claim 14, "consisting" should be added after group; on line 2 of claim 23, "consisting" should be added after group. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an

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international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1 and 2 are rejected under 35 U.S.C. 102(e) as being anticipated by Chiang et al., US 2002/0068458 A1.

Re claim 1, Chiang et al. disclose a method of thin film deposition for integrated circuit fabrication, comprising: (a) providing a substrate (e.g. paragraph [0024]); (b) forming an organosilicate layer on the substrate (e.g. paragraph [0049]), and (c) treating the organosilicate layer with a plasma (e.g. paragraphs [0025] and [0049]).

Re claim 2, the method disclosed by Chiang et al. further comprises: (d) treating the substrate with plasma prior to forming the organosilicate layer thereon (e.g. paragraph [0024]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 3-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chiang et al., US 2002/0068458 A1 in view of Jiang et al., US 2002/0081855 A1.

Re claim 3, the method disclosed by Chiang et al. includes all the limitations claimed except that the plasmas of steps (b) and (d) are generated in a reaction chamber by applying an electric field to a gas mixture comprising oxygen and hydrogen (H₂O₂). Jiang et al. teaches that

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the H_2O_2 plasma chemistry is an equivalent plasma chemistry known in the art (e.g. paragraph [0013]). Therefore, because these two plasma chemistries were art-recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to generate plasma by applying an electric field to a gas mixture comprising oxygen and hydrogen (H_2O_2) in place of H_2 .

Re claim 4, in the modified method of Chiang et al. the gas mixture further comprises argon (Ar) (e.g. paragraph [0025]).

Re claim 5, in the modified method of Chiang et al. the electric field is a radio frequency (RF) power (e.g. paragraph [0025]).

Re claim 6, the modified method of Chiang et al. discloses the claimed invention except that the RF power for generating plasma is within a range of about 1 watt/cm² to about 100 watts/cm². However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use RF power within a range of about 1 watt/cm² to about 100 watts/cm² in order to generate plasma since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Re claim 7, in the modified method of Chiang et al. the reaction chamber is maintained at a pressure within a range of about 1 torr to about 10 torr (e.g. paragraph [0026]).

Re claim 8, in the modified method of Chiang et al. the plasma treatment is performed at a temperature within a range of about 50°C to about 400°C (e.g. paragraph [0027]).

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Re claim 9 and 10, in the modified method of Chiang et al. the oxygen (O_2)/hydrogen (H_2) and inert gases are provided to the reaction chamber at flow rates of 400 sccm as disclosed by Jiang et al. (e.g. Table in paragraph [0014]).

5. Claims 11-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chiang et al., US 2002/0068458 A1 in view of Vincent et al., US 2002/0142579 A1.

Re claim 11, the method disclosed by Chiang et al. includes all the limitations claimed except for the steps for forming the organosilicate layer. Vincent et al. disclose a method of forming organosilicate layer by: (e) positioning the substrate in a deposition chamber; (f) providing a gas mixture to the deposition chamber, wherein the gas mixture comprises a silicon source, a carbon source, and an oxygen source; and (g) applying an electric field to the gas mixture in the deposition chamber to form the carbon-containing silicate layer on the substrate (e.g. paragraphs [0058] to [0060] and [0084]). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method disclosed by Chiang et al. to include the steps of forming organosilicate layer disclosed by Vincent et al. in order to form a low dielectric constant dielectric film.

Re claim 12, in the modified method of Chiang et al. the silicon source and the carbon source disclosed by Vincent et al. comprise an organosilane compound having the general formula $Si_aC_bH_cO_d$, where a has a range between 1 and 2, b has a range between 1 and 10, c has a range between 6 and 30, and d has a range between 0 and 6 (e.g. paragraphs [0033] to [0041]).

Re claim 13, in the modified method of Chiang et al. the organosilane compound disclosed by Vincent et al. is methoxysilane ($SiCH_3O$) (e.g. Table 1).

Re claim 14, in the modified method of Chiang et al. the oxygen source disclosed by Vincent et al. is nitrous oxide (N_2O) (e.g. paragraph [0031]).

Re claim 15, in the modified method of Chiang et al. the electric field applied to the gas mixture in the deposition chamber is a radio frequency (RF) power (e.g. paragraph [0084]).

Re claim 16, in the modified method of Chiang et al. the RF power is within a range of about 1 watt/cm² to about 500 wattS/cm² (e.g. Table 4).

Re claim 17, in the modified method of Chiang et al. the deposition chamber is maintained at a pressure between about 1 torr to about 500 torr (e.g. paragraph [0070]).

Re claim 18, in the modified method of Chiang et al. the organosilane compound is provided to the deposition chamber at a flow rate in a range of about 50 sccm to about 1,000 sccm (e.g. paragraph [0068]).

Re claim 19, in the modified method of Chiang et al. the oxygen source is provided to the deposition chamber at a flow rate in a range of about 10 sccm to about 200 sccm (e.g. paragraph [0068]).

Re claim 20, in the modified method of Chiang et al. the ratio of the oxygen source to the organosilane compound is about 1:1 (e.g. paragraph [0062]).

Re claim 21, in the modified method of Chiang et al. the deposition chamber is maintained at a temperature between about 50°C to about 500°C (e.g. Table 4).

Re claim 22, in the modified method of Chiang et al. the gas mixture further comprises an inert gas (e.g. Table 4).

Re claim 23, in the modified method of Chiang et al. the inert gas is helium (He) (e.g. Table 4).

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Re claim 24, in the modified method of Chiang et al. the inert gas is provided to the deposition chamber at a flow rate of 150 sccm (e.g. Table 4).


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aneta B. Cieslewicz whose telephone number is (703) 308-7607. The examiner can normally be reached M-F (8:00 a.m. - 4:30 p.m.).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached at (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

ABC
March 31, 2003


LONG PHAM
PRIMARY EXAMINER